SECTION 15610

WELDING PRESSURE PIPING

1. REFERENCE PUBLICATIONS

1.1 Some or all of the publications referred to hereinafter form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition at time of contract award of the referenced publications shall govern.

1.1 American National Standards Institute (ANSI) Standards:

ANSI Z49.1 (1988) Safety in Welding and Cutting.

1.2 American Society of Mechanical Engineers (ASME) Publications:

ASME B31.1 (1992; B31.1a; B31.1b) Power Piping.

ASME B31.3 (1993; B31.3a) Chemical Plant and Petroleum Refinery Piping.

ASME B31.4 (1992) Liquid Transmission System for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia, and Alcohols.

ASME B31.5 (1992; B31.5a) Refrigeration Piping ASME B31.8 (1992; B31.8a) Gas Transmission and Distribution Piping Systems.

ASME BPV I (1992; Addenda Dec 1992, Dec 1993) & Boiler and Pressure Vessel Code; Section I, Power Boilers.

ASME BPV (1992; Addenda Dec 1992, Dec 1993) II Pt C Boiler and Pressure Vessel Code; Section II Materials, Pary C - Specifications for Welding Rods, Electrodes and Filler Material ASME BPW V (1992; Addenda Dec 1992, Dec 1993) & Boiler and Pressure Vessel Code; Section V, Non-destructive Examination.

ASME BPW Section IX (1992; Addenda Dec 1992, Dec 1993) & Boiler and Pressure Vessel Code; Welding and Brazing Qualifications.

1.3. American Society for Nondestructive Testing (ASNT):

ASNT-01 (1988) Recommended Practice SNT-TC-1A.

ASNT-02 (1980) Question and Answer Book A: Radiographic Test Method; Levels I, II and III (Supplement to Recommended Practice SNT-TC-1A).

ASNT-03 (1980) Question and Answer Book B: Magnetic

Particle Method; Levels I, II, and III (Supplement to Recommended Practice SNT-TC-1A).

ASNT-04 (1980) Question and Answer Book C:Ultrasonic Testing Method; Level I, II, and III (Supplement to Recommended Practice SNT-TC-1A).

ASNT-05 (1980) Question and Answer Book D: Liquid Penetrant Testing Method; Level I, II, and III (Supplement to Recommended Practice SNT-TC-1A.

1.4 American Welding Society (AWS) Publications:

AWS A2.4 (1986) Symbols for Welding, Brazing and Nondestructive Testing.

AWS A3.0 (1989) Standard Welding Terms and Definitions.

AWS D10.9 (1980) Qualification of Welding Procedures and Welders for Piping and Tubing.

AWS IQC (1988) Standards for AWS Certification of Welding Inspectors.

1.5 Definitions

Definitions shall be in accordance with AWS A3.0.

2. GENERAL REQUIREMENTS

2.1 This section covers the welding of pressure piping systems Deviations from applicable codes, approved procedures, and approved shop drawings will not be permitted without prior written approval from the Contracting Officer's Representative (COR). Materials or components with welds made off the site will not be accepted if the welding does not conform to the requirements of this specification unless otherwise specified. Procedures shall be developed by the Contractor for welding all metals included in the work. Welding shall not be started until welding procedures, welders, and welding operators have been qualified.

2.2 PREVIOUS QUALIFICATIONS: Welding procedures, welders, and welding operators previously qualified by test may be accepted for the work without re-qualification, provided that all of the following conditions are fulfilled.

a. Copies of the welding procedures, the procedure qualification test records, and the welder and welding operator performance qualification test records are submitted and approved in accordance with Submittals Section 01300 paragraph 1.7.1 & 1.7.2.

b. Testing was performed by an approved testing laboratory or

technical consultant or by the Contractor's approved quality assurance organization.

c. The welding procedures, welders, and welding operators were qualified in accordance with Section IX, ASME Boiler and Pressure Vessel Code, or AWS D10.9, AR-2 level; and base materials, filler materials, electrodes, equipment, and processes conformed to the applicable requirements of this specification.

2.3 PERFORMANCE: The Contractor shall be responsible for the quality of all joint preparation, welding, and examination. All materials used in the welding operations shall be clearly identified and recorded. The inspection and testing defined in this specification are minimum requirements. Additional inspection and testing shall be the responsibility of the Contractor when he deems it necessary to achieve the quality required.

2.4 DEFINITIONS: Definitions shall be in accordance with AWS A3.0.

2.5 SYMBOLS: Symbols shall be in accordance with AWS A2.4.

2.6 SAFETY: Safety precautions shall conform to ANSI Z49.1.

2.7 DELIVERY AND STORAGE: All filler metals, electrodes, fluxes, and other welding materials shall be delivered to the site in manufacturers' original packages and stored in a dry space until used. Packages shall be properly labeled and designed to give maximum protection from moisture and to assure safe handling.

3. WELDING PROCEDURES QUALIFICATION

3.1 The contractor shall record in detail and shall qualify the Welding Procedure Specifications for every welding procedure that he proposes. Qualification for each welding procedure shall conform to the requirements of ASME B31.1, ASME B31.3, ASME B31.4, ASME B31.5 and ASME B31.8 and to this specification. The welding procedures shall specify end preparation for butt welds including cleaning, alignment, and root openings. Preheat, interpass temperature control and post-heat treatment of welds shall be as required by approved welding procedures unless otherwise indicated or specified. The type of backing rings or consumable inserts, if used, shall be described and, if they are to be removed the removal process shall be described. Copies of the welding procedure specifications and procedure qualification test results for each type of welding required shall be submitted in accordance with section 01300 paragraph 1.7.1 and 1.7.2 herein. Approval of any procedure does not relieve the Contractor of the sole responsibility for producing acceptable welds. This information shall be submitted on the forms printed in Section IX, ASME Boiler and Pressure Vessel Code, or their equivalent. Welding procedure qualifications shall be identified individually and shall be referenced on the shop drawings or keyed to the contract drawings.

4. WELDER AND WELDING OPERATOR PERFORMANCE QUALIFICATION

4.1 Each welder and welding operator assigned to work shall be qualified by performance tests using equipment, positions, procedures, base metals and electrodes or bare filler wires from the same specification, classification, or group number that will be encountered on his assignment. Welders or welding operators who make acceptable procedure qualification test welds will be considered performance-qualified for the welding procedure used. Performance qualification shall be determined in accordance with Section IX, ASME Boiler and Pressure Vessel Code and as specified.

4.2 CERTIFICATION: Before assigning welders or welding operators to the work, the Contractor shall provide the Contracting Officer with their names together with certification that each individual is performance-qualified as specified. The certification shall state the type of welding and positions for which each is qualified, the code and procedure under which each is qualified, date qualified, and the firm and individual certifying the qualification tests.

4.3 RENEWAL OF QUALIFICATIONS: Re-qualification of a welder or welding operator shall be required under any of the following conditions:

a. When a welder or welding operator has not used the specific welding process for a period of 3 months; the period may be extended to 6 months if he has been employed on some other welding process.

b. There is specific reason to question his ability to make welds that will meet the requirements of the specifications.

c. The welder or welding operator was qualified by an employer other than those firms performing work under this contract and a qualification test has not been taken within the preceding l2 months; renewal of qualification under this condition need be made on only a single test joint or pipe of any thickness, position, or material to reestablish the welder's or welding operator's qualification for any thickness, position, or material for which he had qualified previously.

5. WELDING MATERIALS

5.1 Welding materials shall comply with Section II, ASME Boiler and Pressure Vessel Code. Welding equipment, electrodes, welding wire, and fluxes shall be capable of producing satisfactory welds when used by a qualified welder or welding operator using qualified welding procedures.

6. WELDING OPERATIONS

6.1 Welding shall be performed in accordance with qualified procedures using qualified welders and welding operators. Welding shall not be done when the quality of the completed weld could be

impaired by the prevailing working or weather conditions. The COR shall determine when weather or working conditions are unsuitable for welding.

7. INSPECTIONS AND TESTS

7.1 Inspection shall be performed by the Government and by the Contractor to detect surface and internal discontinuities in completed welds. When inspection indicates defects in a weld joint, the weld shall be repaired by a qualified welder to the satisfaction of the COR.

7.2 VISUAL INSPECTION: Weld joints shall be inspected visually as follows:

a. Before welding - for compliance with requirements for joint preparation, placement of backing rings or consumable inserts, alinement and fit-up, and cleanliness.

b. During welding - for conformance to the qualified welding procedure.

c. After welding - for cracks, contour and finish, bead reinforcement, undercutting, overlap, and size of fillet welds.

7.3 Inspection and Tests by the Government: The Government will perform inspection and supplemental nondestructive or destructive tests as deemed necessary. The cost of any required non-destructive testing (NDT) will be borne by the Government. The correction and repair of defects and the reexamination of weld repairs shall be performed by the Contractor at no additional cost to the Government. Inspection and tests will be performed as required for visual inspection and NDT, except that destructive tests may be required also. When destructive tests are ordered by the Contracting Officer and performed by the Contractor and the specimens or other supplemental examinations indicate that the materials and workmanship do not conform to the contract requirements, the cost of the tests, corrections, and repairs shall be borne by the Contractor. When the specimens or other supplemental examinations of destructive tests indicate that materials or workmanship do conform to the specification requirements, the cost of the tests and repairs will be borne by the Government. When destructive tests are made, repairs shall be made by qualified welders or welding operators using welding procedures which will develop the full strength of the members cut. Welding shall be subject to inspection and tests in the mill, shop, and field. When materials or workmanship do not conform to the specification requirements, the work may be rejected at any time before final acceptance of the system containing the weldment.

8. ACCEPTANCE STANDARDS

8.1 VISUAL: The following indications are unacceptable:

a. Cracks - external surface.

b. Undercut on surface which is greater than 1/32-inch deep.

c. Weld reinforcement greater than 3/16-inch.

d. Lack of fusion on surface.

e. Incomplete penetration (applies only when inside surface is readily accessible).

f. Convexity of fillet weld surface greater than 10 percent of longest leg plus 0.03 inch.

g. Concavity in groove welds.

h. Concavity in fillet welds greater than 1/16-inch.

i. Fillet weld size less than indicated or greater than 1-1/4 times the minimum indicated fillet leg length.

8.2 MAGNETIC PARTICLE EXAMINATION: The following relevant indications are unacceptable:

a. Any cracks and linear indications.

b. Rounded indications with dimensions greater than 3/16-inch.

c. Four or more rounded indications in a line separated by 1/16-inch or less edge-to-edge.

d. Ten or more rounded indications in any 6 square inches of surface with the major dimension of this area not to exceed 6 inches with the area taken in the most unfavorable location relative to the indications being evaluated.

8.3 LIQUID PENETRANT EXAMINATION: Indications whose major dimensions are greater than 1/16 of an inch shall be considered relevant. The following relevant indications are unacceptable:

a. Any cracks or linear indications.

b. Rounded indications with dimensions greater than 3/16-inch.

c. Four or more rounded indications in a line separated by 1/16-inch or less edge-to-edge.

d. Ten or more rounded indications in any 6 square inches of surface with the major dimension of this area not to exceed 6 inches with the area taken in the most unfavorable location relative to the indications being evaluated.

8.4 RADIOGRAPHY: Welds that are shown by radiography to have any

of the following discontinuities are unacceptable:

a. Porosity in excess of that shown as acceptable in Appendix A-250 of Section I of the ASME Boiler and Pressure Vessel Code.

b. Any type of crack or zone of incomplete fusion or penetration.

c. Any other elongated indication which has a length greater than:

(1) 1/4-inch for t up to 3/4-inch, inclusive.

(2) 1/3 t for t from 3/4-inch to 2-1/4-inches, inclusive.

(3) 3/4-inch for t over 2-1/4-inches where t is the thickness of the thinner portion of the weld.

d. Any group of indications in line that have an aggregate length greater than t in a length of 12t, except where the distance between the successive indications exceeds 6L where L is the longest indication in the group. Where "t" pertains to the thickness of the weld being examined; if a weld joins two members having different thickness at the weld, "t" is the thinner of these two thicknesses.

9. CORRECTIONS AND REPAIRS

9.1 Defects shall be removed and repaired as specified in ASME B31.1, ASME B31.3, ASME B31.4, ASME B31.5 and ASME B31.8 , unless directed otherwise by the COR. Disqualifying defects discovered between weld passes shall be repaired before additional weld material is deposited. Wherever a defect is removed, and repair by welding is not required, the affected area shall be blended into the surrounding surface eliminating sharp notches, crevices, or corners. After defect removal is complete and before rewelding, the area shall be examined by the same test method which first revealed the defect to ensure that the defect has been eliminated. After rewelding, the repaired area shall be re-examined by the same test method originally used for that area. Any indication of a defect shall be regarded as a defect unless re-evaluation by NDT or by surface conditioning shows that no disqualifying defects are present. The use of any foreign material to mask, fill in, seal, or disguise welding defects will not be permitted.

***** END OF SECTION *****